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January 15, 1998

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Mr. Joseph Holonich, Chief
U.S. Nuclear Regulatory Commission
High-Level Waste and Uranium
Recovery Projects Branch MST-7-J-9
Division of Waste Management
Rockville, MD 20852

Re: Docket No. 40-8903
License No. SUA-1471
Request for Change in Ground-water Restoration Plan

Dear Mr. Holonich:

Homestake Mining Company of California (HMC) has been implementing a ground-water restoration plan for the Grants Uranium Mill site in accordance with License Condition 35 of Radioactive Materials License SUA-1471. The current plan consists of extracting ground-water from the upper aquifer (alluvial) and discharging it into one of two evaporation ponds. Evaporation is enhanced by a water spray system. In order to maintain desired groundwater gradient reversals for controlling movement of the contaminated plume, groundwater from an uncontaminated deeper aquifer (San Andres aquifer) is pumped and injected into the alluvial aquifer through a series of injection wells. The constituents of concern in the alluvial aquifer have been identified as uranium, selenium, and molybdenum.

In an attempt to improve the ground-water restoration efficiency, HMC is proposing changes that should overcome two limiting factors in the current system. First, the current pumping rate is limited by the amount of water that can be practically evaporated. The natural evaporation rate is dependent on uncontrolled meteorological conditions and the surface area of the evaporation ponds. Secondly, while the water quality of the deeper aquifer has been very effective to date for restoration when injected into the alluvial aquifer, the high amount of total dissolved solids (TDS) reduces the overall restoration efficiency rates.

To overcome these conditions, Homestake proposes to install a water treatment plant using lime softening and reverse osmosis (RO) membrane treatment technology to treat the contaminated water. This water will have low TDS and constituents of concern. The water will be reinjected into the alluvial aquifer to maintain the hydraulic gradients. This should reduce the site's reliance on natural evaporation rates to keep the ground-water program on schedule. In addition, the TDS level for the RO product water to be injected will be in the 100 ppm range thereby effectively increasing the potential to accelerate the restoration program.

HMC believes that this proposed system change will allow HMC to continue to meet the current ground-water restoration schedule while conforming with the environmental concerns in the NRC document, "Uranium Recovery Program Policy and Guidance Directive, DWM 95-01".

Proposed System

The proposed RO plant, described in the attachment ("Evaluation of Injection of Reverse Osmosis Product Water"), includes a lime softening step for pH control followed by two RO membrane treatment systems to remove the contaminants from the water that is pumped from the alluvial aquifer. The RO product water will be passed through an ion-exchange resin bed for a final polishing treatment to remove additional residual uranium and molybdenum before injection into the alluvial aquifer.

The RO product water will be mixed with the currently-used deep well fresh water and injected into the existing ground-water injection system down gradient from the tailings piles. These existing injection wells are located to maintain the hydraulic gradients necessary to control the movement of the contaminated ground-water plume. A number of the wells are located at the site boundary and some are located in a line up-gradient of the boundary wells. Due to the high injection rate, the injected water travels both down gradient offsite and up gradient towards the center of the contaminated plume.

The RO product water may also be injected into the alluvial aquifer within the contaminated plume (control zone) to assist in the extraction of contaminants in the proximity of the tailings pile. Pure RO product water, fresh water from the deep San Andres aquifer, or a mixture of the two sources of water may be used for this purpose.

There will be no air or surface water effluent discharge from the proposed system. The brine from the RO units and any regeneration waste water from the ion-exchange and lime softening units will be collected in the existing evaporation ponds. Upon decommissioning, the sediments in the evaporation ponds will be consolidated and encapsulated with the tailings in the Small Tailings Pile.

The flow rates, ground-water monitoring program, and other features of the design are presented in the attachment.

Water Quality of Injected Water

The water quality is based on data from a RO pilot plant that operated at the site in 1995. While many constituents were measured as a part of that study (Table 2 of Attachment), the only parameters of interest in the ground-water restoration program are uranium, selenium, molybdenum, and TDS. Concentrations of the feed-water input to the RO units during the pilot plant operation are presented in Table 3 of the attached report with TDS varying from 1,880 to 12,942 mg/l, uranium from 0.017 to 47.4 mg/l, selenium from 0.007 to 3.57 mg/l, and molybdenum from <0.03 to 47.1 mg/l. Table 2 of the attached report presents the concentrations for the treated water which range from 18-211 mg/l for TDS, <0.001-0.4 mg/l for uranium, <0.005 to 0.03 mg/l for selenium, and <0.03-0.55 mg/l for molybdenum.

Concentrations of 0.04 mg/l for uranium, 0.1 mg/l for selenium, and 0.03 for molybdenum have been established by the NRC as the site ground-water protection standards. These levels were based on a very early assessment of site background levels for these constituents. After evaluating the data from several years of sampling several up-gradient background wells, the upper range of the background concentrations for uranium are several times greater than the site standards. These low site standards presents a special problem since it is desirable that the reinjected water meet the site standards if injection is done to maintain the hydraulic barrier. Note that injection is also done up gradient of the boundary injection wells as part of the recovery program to assist in removal of contaminants.

The input parameters for the selected RO feed-water extraction (collection) wells are estimated to average approximately 11,500 mg/l for TDS, 30 mg/l for uranium, 2.5 mg/l for selenium, and 40 mg/l for molybdenum. The input concentrations will vary slightly over time as restoration approaches the Large Tailing Pile and the input wells are changed to meet site restoration goals. Assuming that this is representative of the feed water for the pilot study, the removal efficiency is approximately 99 percent. The addition of the ion-exchange polishing unit is expected to enhance the removal of the uranium and molybdenum ionic species beyond the 99 percent level, perhaps increasing the total efficiency to as high as 99.9 percent. This would result in a projected average uranium concentration of 0.03 mg/l or less and a molybdenum concentration of less than 0.03 mg/l. These are roughly the site standards for both constituents. However, the maximum uranium concentration in the background wells for 1997 was 0.15 mg/l. The selenium concentrations of the pilot plant RO treated water were already lower than the measured background values and the site standard for selenium. Background data is further discussed in Section 2.4 of the attachment.

To assure that the injected water meets the site standards when injecting the water for maintenance of the hydraulic barrier, provisions have been made to mix the RO product water with the San Andres (fresh water supply) water. This will also be done if it is necessary to meet the injection rate goals. If it is desired to inject water into the control zone, RO water will be mixed with fresh water when necessary. Concentrations of the constituents of concern will be limited to 80 percent of that exists at the time in the control zone at the point of injection.

Radiological Dose Assessment to Individual Members of the Public

The applicable NRC guidance (DWM 95-01) for uranium recovery facilities limits the effluent to dose levels specified in 10 CFR Part 20. The dose to the individual members of the public is calculated based on a projected average uranium (natural uranium) concentration in the effluent of the treatment unit of 0.04 mg/l, or 27 pCi/l. In order to demonstrate compliance with the dose limits in 10 CFR Part 20, §20.1301, licensees must follow the provisions of §20.1302. In order to avoid an explicit dose calculation, the provision allows one to demonstrate that the annual average radionuclide concentration in the effluent is less than the limit in Table 2 of Appendix B to §20.1001-20.2401 and that the dose from external sources to any exposed individual will not exceed 50 mrem/year. From Table 2, the concentration limit for uranium in water discharged is 300 pCi/l. The estimate of the dose equivalent to the maximum exposed individual at the site perimeter (see second half 1996 Semi-Annual Environmental Monitoring Report) is 42 mrem/year. This annual dose rate, along with the projected uranium concentration of 27 pCi/l, shows that this criterion is clearly met. HMC considers that the use of the last available (1996) measured dose equivalent from external sources at the site boundary is appropriate for the future since there are no planned activities at the site that will increase the gamma-ray dose rate at the site perimeter. In addition, the constituents in the treated water will decline with time since HMC considers that the concentrations at the alluvial-aquifer extraction wells have peaked.

Since the average uranium concentration for the output of the RO unit is projected to be 0.31 mg/l (210 pCi/l), the system fulfills the requirements of the NRC without the ion-exchange polishing unit. An IX polishing unit will be used to reduce the projected uranium concentration in the injection water. In addition HMC proposes to blend the RO product water with the currently used fresh water injection water to ensure that the proposed injection water will be below the NRC site release standard limits of 0.04 mg/l uranium.

Impact From Other Site Specific Hazardous Constituents

As indicated above, the RO unit will reduce the TDS of the water to levels far below an average of 1,000 mg/l. In addition, the selenium concentrations are expected to be below the site specific guideline of 0.1 mg/l. However, the output of the RO unit during the pilot study showed that the molybdenum levels ranged from 0.03 mg/l to 0.55 mg/l, most of which are above the site ground-water standard of 0.03 mg/l. It is anticipated that the ion-exchange polishing unit will have a 90 percent removal efficiency for molybdenum which will further reduce the molybdenum levels. The importance of molybdenum as a constituent of concern may be diminished since the EPA has removed molybdenum from the list of constituents for drinking water standards. As with uranium, HMC proposes that the blending of the RO product water with the fresh water injection water will further ensure that the proposed injection water will be below the NRC site release standard limits for molybdenum of 0.03 mg/l.

In conclusion, HMC believes that the proposed change in the ground-water restoration program will result in a more efficient program while fulfilling the NRC requirements in "Uranium Recovery Program Policy and Guidance Directive, DWM 95-01." We also anticipate that the average concentration of the constituents in the treated water that will be injected into the alluvial aquifer will meet the site ground-water protection standards. We therefore request permission to implement this program through an amendment to our radioactive materials license. Please advise me if you need additional information.

Sincerely,

HOMESTAKE MINING COMPANY OF CALIFORNIA

Roy R. Cellan
Corporate Manager, Reclamation

RRC:jg

Attachments

cc: Mr. Ken Hooks, NRC Project Manager w/encl
Mr. C. Cain, NRC Arlington, TX w/encl
Mr. Harold F. Barnes, HMC SFO w/encl

EVALUATION OF INJECTION OF REVERSE OSMOSIS PRODUCT WATER

FOR:

HOMESTAKE MINING COMPANY
OF CALIFORNIA

BY:

HYDRO-ENGINEERING, L.L.C.
JANUARY, 1998

GEORGE L. HOFFMAN, P.E.
5831 N.M.
HYDROLOGIST

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1.0 INTRODUCTION

Reverse osmosis (RO) is proposed to be used to allow the collection rate to be larger, to reduce the volume of water in the lined evaporation ponds and produce a good quality water for injection into the alluvial aquifer. A pilot RO plant was operated in late 1995 to evaluate the use of an RO for treating the alluvial collection water. This report presents the details to inject the RO product water into the alluvial aquifer.

2.0 PROPOSED SYSTEM

A production of up to 800 gpm is proposed from the alluvial collection wells, the tailings dewatering wells and toe drains as an input to a line softening and a low pressure RO unit. A high pressure RO unit is proposed to treat the brine discharge from the low pressure RO at a rate up to 200 gpm. These units are expected to produce up to 600 gpm of RO product and up to 200 gpm of brine. Figure 1 shows the location of the collection wells which are proposed to initially supply the RO input water. This figure also shows other potential collection wells that will likely be added in the future to supply the needed input to the RO The particular wells that supply the RO will vary with time. For example, a series of B collection wells will be added in the next few years, while wells near the large tailings will likely be used toward the end of the project. Other wells not shown may also be used to feed the RO due to adjustments in the future in the collection system. Some collection for direct re-injection will likely continue during the RO use period.

The RO product water will be mixed with the San Andres (fresh water supply) water to meet the total injection rate and the injection concentrations. If the RO product concentrations meet the maximum injection concentration, some RO water may be used for injection without mixing with the fresh water. RO product may also be used for alluvial re-injection water in the control zone as long as the concentrations do not exceed 80 percent of the concentrations in the alluvium where the re-injection is occurring.

The product from the RO is proposed to be injected into the J line, G line, M line, X series on the east side of the small tailings pile and WR line. The RO product will be mixed with the San Andres fresh water for injection or injected separately. Figure 2 presents the location of injection wells proposed to initially be used for RO product injection. This figure also shows the wells planned in the future that may be used for RO product injection. These injection wells will be varied with time. Additional WR wells to the northwest of well WR5 will be added to the WR injection line as this area is restored. Injection into the wells at the large tailings will be done toward the end of the restoration program. Future wells not shown may also be used for RO product injection.

Figure 3 presents a schematic of the RO with input from the well and tailings systems and discharge of brine to the high pressure RO. Up to 800 gpm is proposed to be put through a low-pressure and high-pressure RO systems producing up to 600 gpm of RO product water for injection. The brine from the low-pressure RO would be the input to a high pressure RO which should produce equal amounts of RO product for injection and brine for discharge to the evaporation ponds. A dashed line indicates that the toe drains and tailings dewatering could be pumped to the high-pressure RO unit. Also, water from the evaporation ponds could be pumped to supply the high-pressure RO.

2.1 EXPECTED RATES

The expected rates for the RO system at the Grants Project is up to 800 gpm of input to the low pressure RO. Initially, the toe drains and tailings dewatering wells are expected to produce up to 20 percent of the feed to the low-pressure RO system. The two RO units are expected to produce up to 600 gpm of RO product.

The high-pressure RO is planned to take the brine from the low-pressure unit as input and produce 50% RO product. The brine will be discharged to the evaporation ponds. The total amount of RO product is expected to be up to 600 gpm. Initially, the operation rates will likely be less than the 800 gpm of input and 600 gpm of product injection. A total feed of 500 gpm to the low-pressure RO is initially planned. The two RO units should produce 420 gpm of RO product for injection initially. Approximately 200 gpm of San Andres water will be added for a total injection rate of 620 gpm, initially.

2.2 EXPECTED CONCENTRATIONS

Initially, the average input concentration of TDS of the well water, tailings dewatering and toe drains is expected to be approximately 11,500 mg/l to the low-pressure RO (see Table 1). The average concentrations expected from the mix of collection wells, tailings dewatering and toe drains initially proposed is also presented in Table 1 for uranium, selenium and molybdenum at 30, 2.5 and 40 mg/l, respectively. The TDS of the brine water from the low-pressure RO that will be used as input to the high-pressure RO is likely to be roughly 36,000 mg/l.

TABLE 1. PROJECTED INITIAL AVERAGE WATER-QUALITY FEED TO THE LOW-PRESSURE RO

PARAMETERS			
TDS (mg/l)	U (mg/l)	Se (mg/l)	Mo (mg/l)
11,500	30	2.5	40

Table 2 (pages 14 - 16) presents the water-quality of the RO product from the RO pilot study. This analysis shows that the TDS of the water varied from 18 to 211 mg/l. Uranium concentrations varied from <0.001 to 0.4 mg/l. Selenium concentrations varied from less than 0.005 to 0.03 mg/l and molybdenum concentrations varied from <0.03 to 0.55 mg/l. The concentrations from the four different feed sources used during the RO pilot study are presented in Table 3 (pages 17 - 19).

2.3 URANIUM IX POLISHING

An ion exchange column (IX) for removal of uranium and molybdenum will be added to the product discharge streams. The IX polishing is expected to decrease the uranium and molybdenum concentrations in the RO product water significantly. The pilot test indicated that the IX loading will be very slow and, therefore, the resin may not have to be regenerated very often. If the IX resin needs to be regenerated, the product from the regeneration of the resin will be discharged to the lined evaporation ponds. The IX testing during the pilot RO testing indicated that the average uranium and molybdenum concentration after the IX polishing should be less than site standards.

2.4 COMPARISON OF SITE STANDARDS TO BACKGROUND

The hydrologic background conditions at the Grants site are those which exist upgradient or north of the large tailings pile, and these conditions have been monitored since 1976. Ground-water flow in the San Mateo alluvial system is generally from the northeast to the southwest (see Figure 4). Wells DD, P, P1, P2, Q, R and ND, all on the Homestake property, have been used for monitoring background water quality, and they are located just north of the large tailings. Additional background wells located further north were sampled in 1997 (wells 920 and 921, see Figure 4 for locations). Information gathered from these wells has been used to further define the piezometric surface and water-quality conditions in the upgradient alluvial aquifer.

Figure 4 presents the latest 1997 water-quality data for the background wells[1] for four parameters, sulfate, uranium, selenium and chloride. All molybdenum concentrations in these upgradient wells are less than 0.03 mg/l. The sulfate concentrations for these wells upgradient of the large tailings vary from 362 to 1710 mg/l and averaged 1210 in 1997. Uranium concentrations also vary over a large range, from less than 0.01 to 0.15 mg/l with an average of 0.07 mg/l. Three natural uranium concentrations are nearly four times the NRC site standard of 0.04 mg/l. Selenium concentrations vary over an even

[1] Wells DD, ND, P, P1, P2, Q, R, 920 and 921.

larger range, from 0.02 to 0.60 mg/l, with an average value of 0.24 mg/l. The largest 1997 background value is six times the NRC site standard. Chloride concentrations in water sampled from the upgradient wells averaged 66 mg/l in 1997. Chlorides varied over a small range from a low of 52.1 mg/l to a high of 83.8 mg/l.

The range in concentrations in the upgradient wells during 1997 was such that water in all of these background wells[1] exceeded the site standards for selenium or uranium. These site standards were set based on three data points[2] from December 1988, January 1989 and February 1989 from only upgradient well P. The natural areal variability in the background water quality is large. Therefore, several wells and the long historical data base must be used to adequately define background concentrations. A good example of naturally occurring background variations is demonstrated by the uranium concentrations, where concentrations in the Fall of 1997 varied from 0.001 to 0.15 mg/l (see red values on Figure 4). The higher values are nearly four times the site standard of 0.04 mg/l.

Table 4 presents the average of the 1997 background concentrations for selenium, uranium, molybdenum and TDS along with the State and NRC standards. Even the 1997 average values for selenium and uranium are significantly greater than the NRC standards.

2.5 MAXIMUM INJECTION CONCENTRATIONS

The maximum injection concentration and rate is presented in Table 4. This table presents the maximum injection uranium, selenium and molybdenum concentration of 0.04, 0.10 and 0.03 mg/l, respectively. These maximum injection concentrations are the NRC site standards. A maximum injection concentration for TDS of 1770 mg/l is also

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[2] Average of 3 data points from well P in 1988 and 1989.

presented, which is the New Mexico site standard for TDS. Table 4 also presents the likely mixture of RO product water and the deep well water. Initially, the RO product is expected to be 420 gpm with the addition of 200 gpm from the deep well for a total mixed injection of 620 gpm. The mixture of RO TDS of 150 mg/l and deep well TDS of 1850 mg/l should produce an injection TDS of approximately 700 mg/l. An RO product concentration of 0.05 mg/l of uranium mixed with the 0.01 mg/l from the deep well should produce an injection water of slightly less than the maximum concentration of 0.04 mg/l. The injection concentration of the mixed water should be significantly less than the maximum injection concentration for selenium. A mixture of 0.04 mg/l water from the RO with the deep well molybdenum concentration of 0.005 mg/l should produce a mixed injection concentration of 0.029 mg/l. The concentrations and rates from the two sources may vary some but will be mixed to meet the maximum injection concentrations. Injection of only RO product may also be done if it meets the maximum injection concentrations.

TABLE 4. INJECTION AND BACKGROUND CONCENTRATIONS

	Injection Rate (gpm)	TDS (mg/l)	Uranium (mg/l)	Selenium (mg/l)	Molybdenum (mg/l)
Maximum Injection and Site Standards	800	1770#	0.04*	0.10*	0.03*
1997 Avg. Background	-----	2140	0.07	0.24	<0.03
RO w/IX	420	150	0.05	0.03	0.04
Deep Well	200	1850	0.01	0.005	0.007
Mixed Injection	620	698	0.037	0.022	0.029

Note: # = New Mexico Site Standard
* = NRC Site Standard

3.0 BENEFITS OF INJECTION

The use of RO at the Grants site will aid in the reduction of water being discharged to the evaporation ponds. It will enable the collection rates to be increased substantially, which will speed up the restoration of the site. The RO product water, which has very low TDS, is more efficient in restoring the ground-water aquifer than the fresh-water injection. Therefore, the use of RO's will also aid in the restoration of the alluvial aquifer.

4.0 MONITORING

The existing ground-water monitoring program (Table 2, 08/97) for the NRC and the ED is adequate to define any changes due to the use of RO product water for injection. Figure 5 shows the location and frequency of the present monitoring system. The color of the well label shows whether the well is monitored monthly, quarterly, semi-annually or annually.

Composite samples of the RO feed and product water after the IX polishing will be monitored monthly for TDS, SO4, U, Se, Mo and Ra-226 for the first year of operation. A D list of parameters (see Table 2 of NRC or ED permits for parameter list) will be measured annually for the RO product to match the water quality monitoring for the fresh-water injection. The monthly monitoring will be switched to quarterly monitoring after one year if product water quality has been acceptable for the initial year.

The existing evaporation ponds monitoring on a quarterly basis should adequately monitor the concentration in the evaporation ponds where the brine discharge from the high pressure RO will be discharged.

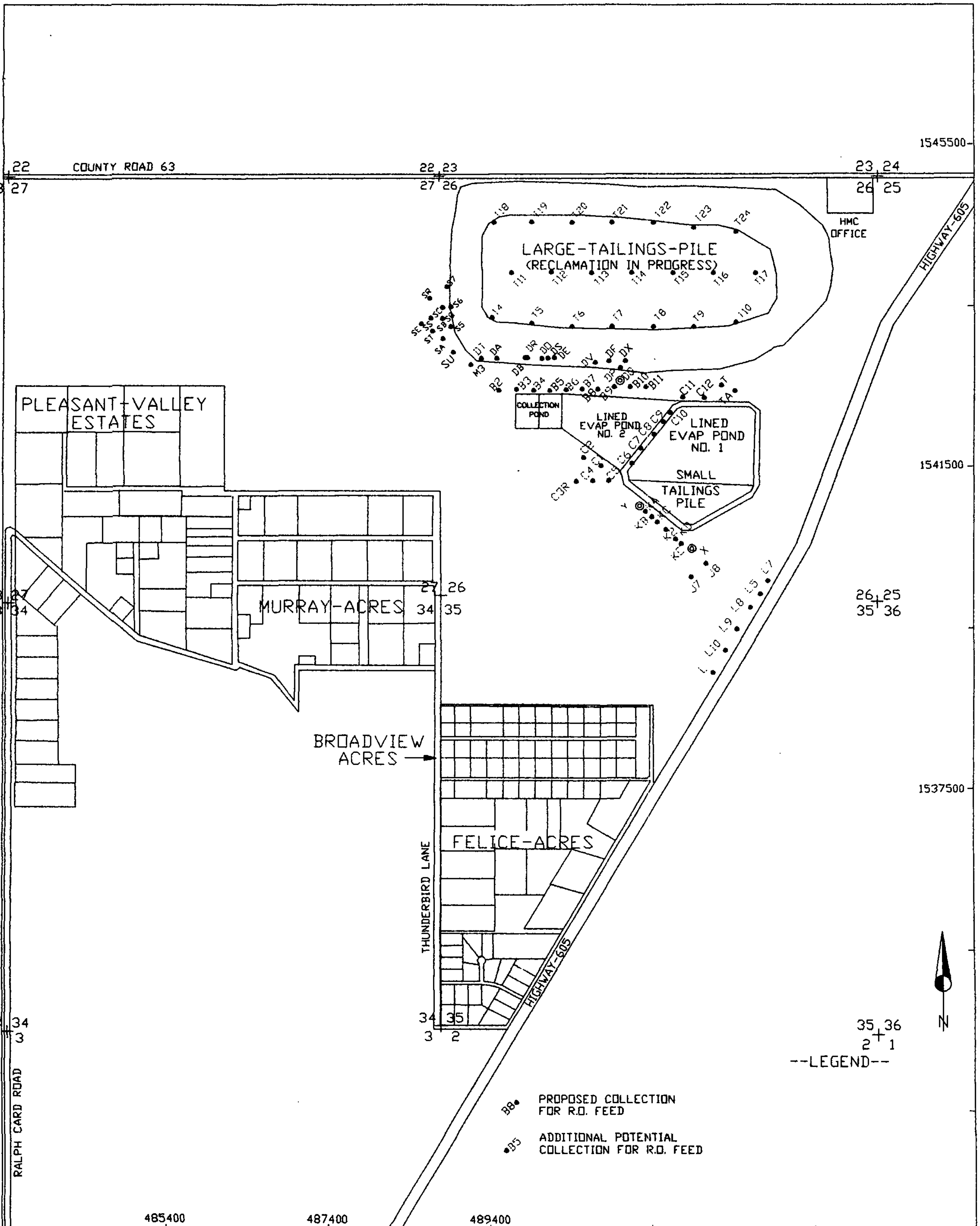

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FIGURE 1. LOCATION OF COLLECTION WELLS FOR INPUT TO THE R.O.

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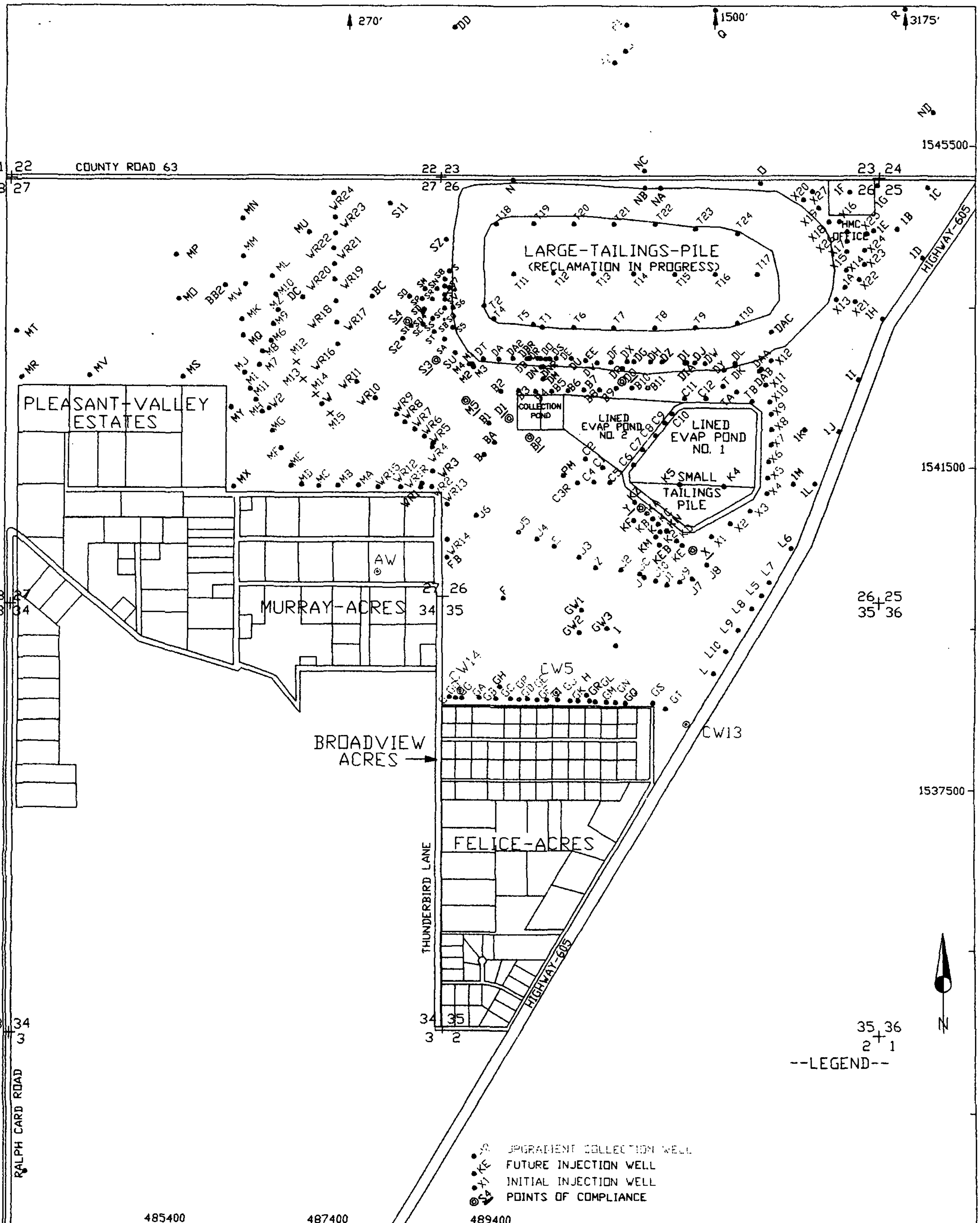

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FIGURE 2. LOCATION OF R.O. PRODUCT INJECTION		9506/ALLWELLS
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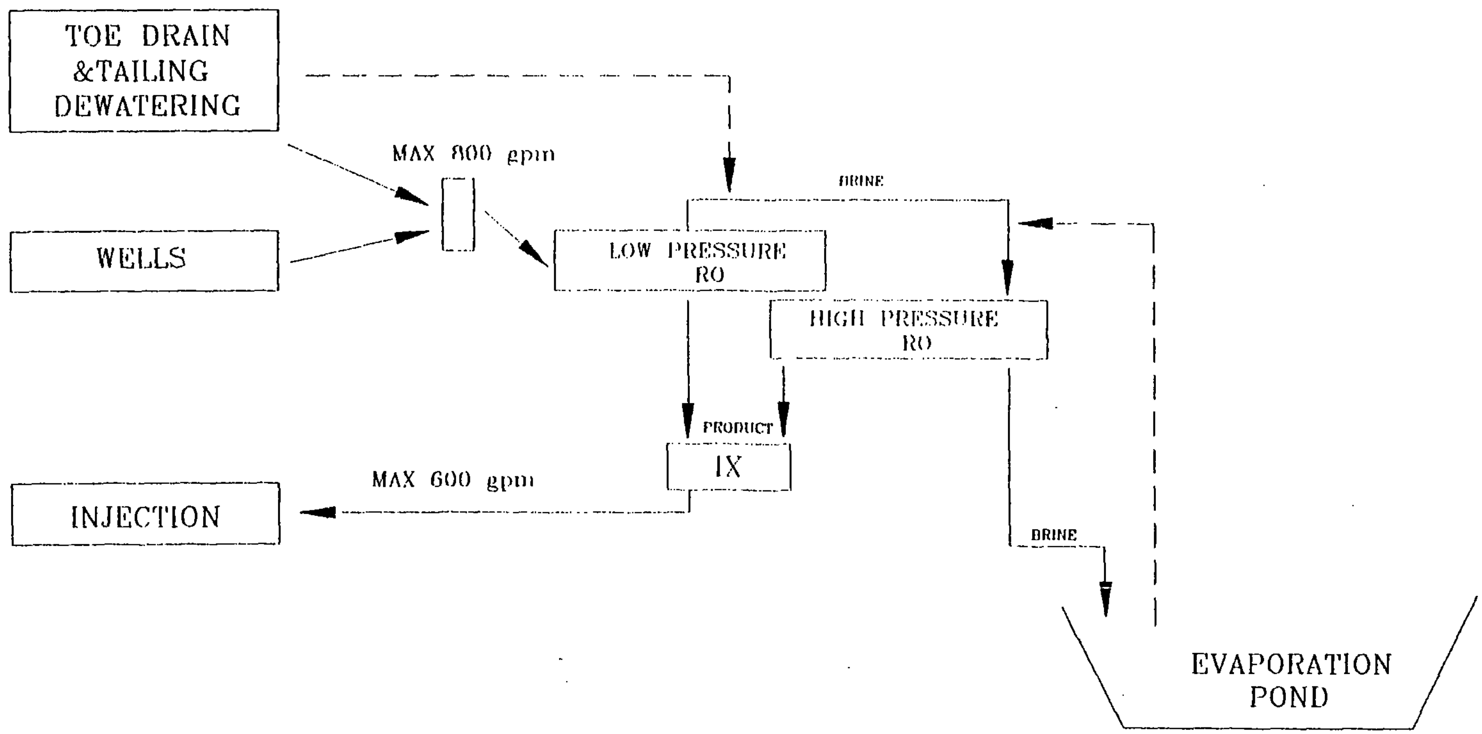

9506/ROSCHEM

FIGURE 3. RO INPUT AND OUTPUT SCHEMATIC

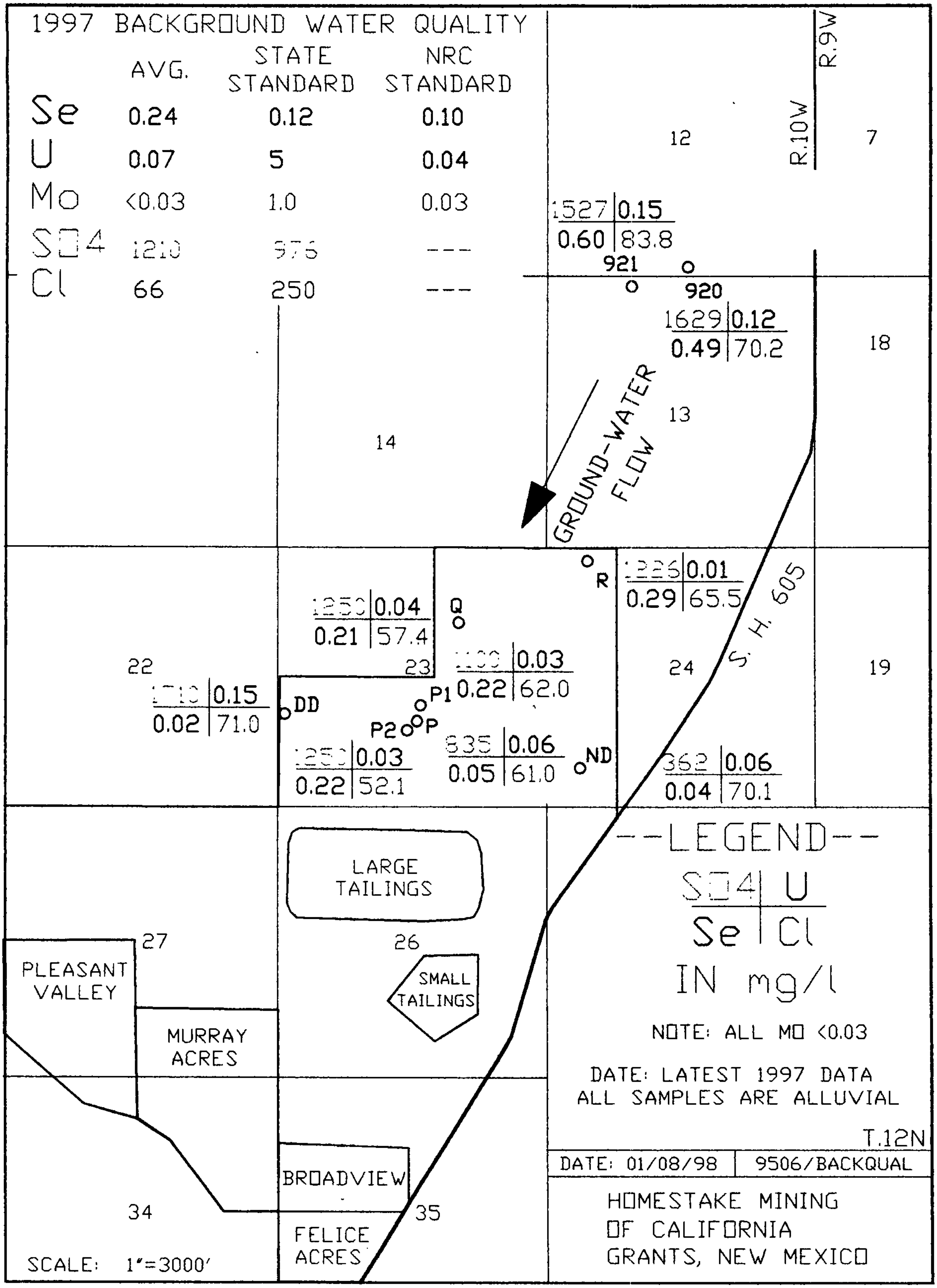

FIGURE 4. BACKGROUND GROUND-WATER QUALITY

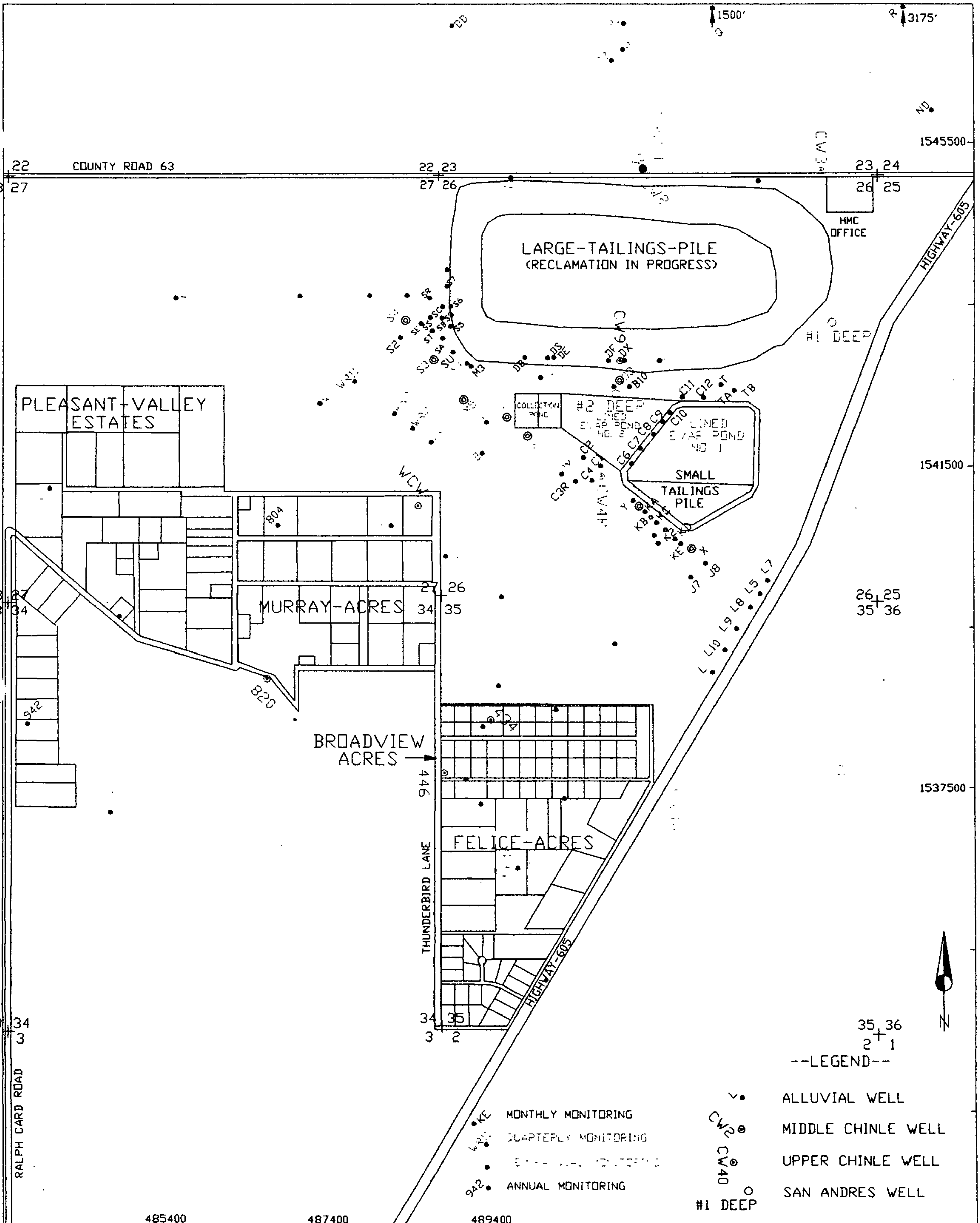

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FIGURE 5. PERMIT GROUND-WATER MONITORING FREQUENCY

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TABLE 2. WATER QUALITY OF THE R.O. PRODUCT FROM THE PILOT TESTS

23-Dec-97

Well Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	CO3 (mg/l)	HCO3 (mg/l)	SO4 (mg/l)	Cl (mg/l)	NO3 (mg/l)	TDS (mg/l)
1310	5/28/94	ENER	4.00	1.000	33.7	< 0.100	0	21.4	47.8	10.8	0.570	108
	5/31/94	ENER	5.20	1.10	41.2	< 0.100	0	34.6	57.3	14.8	0.820	141
	6/1/94	ENER	2.50	0.700	30.3	< 0.100	0	20.9	36.9	12.8	0.860	107
	6/2/94	ENER	2.60	0.700	27.6	< 0.100	0	19.2	35.8	12.5	1.27	97.0
	6/3/94	ENER	2.20	0.600	27.0	< 0.100	0	19.5	32.9	12.5	0.800	93.0
	6/7/94	ENER	1.80	0.500	19.2	< 0.100	0	16.4	26.2	8.40	0.660	64.0
	7/5/94	ENER	0.600	0.200	16.1	< 0.100	0	13.5	16.9	6.10	0.480	48.0
1311	7/13/94	ENER	3.10	1.20	41.5	< 0.100	0	21.4	58.3	16.8	1.66	128
	8/9/94	ENER	2.20	0.900	27.4	< 0.100	0	25.0	34.9	7.37	0.580	82.0
	8/15/94	ENER	2.20	0.900	23.5	< 0.100	0	18.7	32.5	6.70	0.430	83.7
	11/2/94	ENER	3.80	2.00	70.2	0.200	0	40.6	88.4	28.7	1.39	211
	11/29/94	ENER	1.50	1.000	32.0	< 1.000	0	20.0	36.7	11.0	0.570	90.0
1312	8/15/94	ENER	1.60	0.400	9.70	< 0.100	0	13.7	11.5	3.20	0.190	34.0
	9/1/94	ENER	0.500	0.200	6.30	< 0.100	0	9.90	5.20	< 1.000	< 0.100	18.0
	9/28/94	ENER	1.20	0.400	8.10	< 0.100	0	8.00	10.00	3.20	< 0.100	30.0
1313	10/1/94	ENER	2.80	1.000	6.10	0.500	0	13.8	10.3	2.80	< 0.100	29.3

TABLE 2. WATER QUALITY OF THE R.O. PRODUCT FROM THE PILOT TESTS

23-Dec-97

Well Name	Date	Lab	Alk (mg/l)	pH (units)	Cr (mg/l)	Mo (mg/l)	Se (mg/l)	Zn (mg/l)	U (mg/l)	Ra226 (pCi/l)	Ra226 error est.
1310	5/28/94	ENER	17.6	5.68	< 0.050	0.310	0.011	< 0.010	0.270	0.300	0.200
	5/31/94	ENER	28.3	5.93	< 0.050	0.360	0.011	< 0.010	0.260	< 0.200	---
	6/1/94	ENER	---	5.71	< 0.050	0.240	0.008	< 0.010	0.175	< 0.200	---
	6/2/94	ENER	---	5.71	< 0.050	0.230	0.008	< 0.010	0.137	0.400	0.300
	6/3/94	ENER	---	5.63	< 0.050	0.300	0.008	< 0.010	0.129	< 0.200	---
	6/7/94	ENER	---	5.52	< 0.050	0.200	0.008	< 0.010	0.080	< 0.200	---
	6/24/94	ENER	---	---	---	0.100	0.003	---	0.045	---	---
	6/30/94	ENER	---	---	---	0.120	< 0.005	---	0.074	---	---
	7/5/94	ENER	---	5.35	< 0.050	0.130	< 0.005	< 0.010	0.074	< 0.200	---
1311	7/13/94	ENER	---	5.51	< 0.050	0.350	0.023	< 0.010	0.331	< 0.200	---
	8/9/94	ENER	---	6.53	< 0.050	0.260	0.010	< 0.010	0.186	< 0.200	---
	8/15/94	ENER	15.3	5.45	< 0.050	0.300	0.013	< 0.010	0.201	2.80	0.800
	11/2/94	ENER	---	5.61	---	0.550	0.031	---	0.403	< 0.200	---
	11/29/94	ENER	---	5.42	< 0.050	0.260	0.014	< 0.010	0.159	< 0.200	---
1312	8/15/94	ENER	11.2	6.07	< 0.050	0.100	0.007	< 0.010	0.041	0.600	0.500
	9/1/94	ENER	---	5.94	< 0.050	0.040	< 0.005	< 0.010	0.010	< 0.200	---
	9/28/94	ENER	---	5.57	---	0.090	0.007	---	0.038	< 0.200	---
1313	10/1/94	ENER	---	5.60	---	< 0.030	< 0.005	---	< 0.001	< 0.200	---

TABLE 2. WATER QUALITY OF THE R.O. PRODUCT FROM THE PILOT TESTS

23-Dec-97

Well Name	Date	Lab	Ra228 (pCi/l)	Ra228 error est.	Th230 (pCi/l)	Th230 error est.	ANIONS (meq/l)	CATIONS (meq/l)	BALNC (%)	DSSUM (mg/l)	CAR (ratio)
1310	5/28/94	ENER	1.30	0.500	< 0.200	---	1.69	1.75	1.69	111	0.980
	5/31/94	ENER	< 1.000	---	< 0.200	---	2.24	2.15	-2.05	141	1.000
	6/1/94	ENER	< 1.000	---	< 0.200	---	1.53	1.50	-0.990	98.0	1.10
	6/2/94	ENER	1.50	0.500	< 0.200	---	1.50	1.39	-3.89	95.0	1.03
	6/3/94	ENER	3.30	2.30	< 0.200	---	1.41	1.34	-2.83	88.6	1.05
	6/7/94	ENER	3.90	2.50	< 0.200	---	1.10	0.970	-6.26	67.3	0.950
	7/5/94	ENER	< 1.000	---	< 0.200	---	0.780	0.750	-1.98	48.9	0.980
1311	7/13/94	ENER	1.30	1.000	< 0.200	---	2.16	2.06	-2.26	139	0.920
	8/9/94	ENER	7.60	3.60	< 0.200	---	1.39	1.38	-0.260	87.9	0.930
	8/15/94	ENER	< 1.000	---	< 0.200	---	1.20	1.21	0.280	77.2	1.08
	11/2/94	ENER	---	---	---	---	3.41	3.41	-0.010	220	0.960
	11/29/94	ENER	2.10	1.10	< 0.200	---	1.44	1.58	4.38	96.0	0.940
1312	8/15/94	ENER	< 1.000	---	< 0.200	---	0.570	0.540	-2.68	34.2	0.990
	9/1/94	ENER	< 1.000	---	< 0.200	---	0.310	0.320	1.96	19.0	0.960
	9/28/94	ENER	---	---	---	---	0.480	0.460	-3.00	29.4	1.02
1313	10/1/94	ENER	---	---	---	---	0.530	0.500	-2.48	30.8	0.950

NOTE:
1310 = R.O. Product for Collection Wells SA and SB
1311 = R.O. Product for Collection Wells DF, DX and DG
1312 = R.O. Product for Collection Wells KA, KB, KC, KD, KE, X and Y
1313 = R.O. Product for Collection Well #2 Deep

TABLE 3. WATER QUALITY FOR THE R.O. FEED FROM THE PILOT

23-Dec-97

Well Name	Date	Lab	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	CO3 (mg/l)	HCO3 (mg/l)	SO4 (mg/l)	Cl (mg/l)	NO3 (mg/l)	TDS (mg/l)
1316	5/28/94	HMC	404	100.0	2,296	8.80	0	742	4,422	493	8.05	8,610
	6/1/94	HMC	406	121	2,387	7.90	0	601	5,185	490	6.40	9,167
	6/2/94	HMC	406	125	2,417	7.80	0	675	5,144	488	6.50	9,102
	6/3/94	HMC	389	113	2,236	7.90	0	693	5,063	483	8.80	9,089
	6/7/94	HMC	402	121	2,190	4.40	0	732	5,205	483	6.28	9,128
	7/5/94	HMC	353	90.9	2,433	7.50	0	708	5,205	476	6.61	9,058
1317	7/13/94	HMC	464	206	3,350	4.90	0	999	7,334	775	22.2	12,942
	8/15/94	HMC	592	174	3,418	6.20	0	1,280	6,707	784	20.4	12,565
	11/2/94	HMC	433	159	3,286	6 00	0	323	7,166	767	27.9	12,661
1318	8/15/94	HMC	271	65.8	822	6.30	0	340	1,984	335	1.60	3,878
	9/28/94	HMC	272	69.9	926	6.60	0	382	2,063	325	5.47	3,800
1320	10/1/94	HMC	258	84.0	266	11.8	0	303	913	186	2.03	1,880
1322	11/28/94	HMC	154	200	3,837	4.10	0	1,437	7,249	796	29.0	12,739
	11/29/94	HMC	274	222	3,447	7.60	0	1,354	7,410	787	29.4	12,637

TABLE 3. WATER QUALITY FOR THE R.O. FEED FROM THE PILOT

23-Dec-97

Well Name	Date	Lab	Alk (mg/l)	pH (units)	Cr (mg/l)	Mo (mg/l)	Se (mg/l)	Zn (mg/l)	U (mg/l)	Ra226 (pCi/l)	Ra226 error est.
1316	5/28/94	HMC	608	7.11	< 0.050	25.9	0.938	< 0.010	22.0	0.400	0.400
	6/1/94	HMC	---	6.50	< 0.050	31.0	0.621	0.030	20.2	0.800	0.500
	6/2/94	HMC	---	6.54	< 0.050	28.6	0.554	0.040	23.2	1.000	0.500
	6/3/94	HMC	---	6.58	< 0.050	31.0	0.743	0.030	21.3	0.500	0.500
	6/7/94	HMC	---	6.47	< 0.050	37.5	1.23	0.030	22.0	< 0.200	—
	7/5/94	HMC	---	7.20	< 0.050	31.9	1.34	0.030	33.4	0.200	0.100
1317	7/13/94	HMC	—	6.83	< 0.050	47.1	3.18	< 0.010	36.9	7.80	1.30
	8/15/94	HMC	1,049	6.99	< 0.050	38.5	2.65	0.030	47.4	8.70	1.20
	11/2/94	HMC	---	7.23	---	45.7	3.57	---	36.8	< 0.200	---
1318	8/15/94	HMC	279	6.93	< 0.050	13.0	0.985	0.030	5.08	1.000	0.400
	9/28/94	HMC	---	7.28	< 0.050	10.5	0.774	< 0.010	6.29	< 0.200	—
1320	10/1/94	HMC	---	7.22	< 0.050	< 0.030	0.007	< 0.010	0.017	0.700	0.300
1322	11/28/94	HMC	---	7.10	< 0.050	42.2	2.28	< 0.010	43.1	< 0.200	—
	11/29/94	HMC	---	7.48	< 0.050	40.6	3.03	< 0.010	44.6	< 0.200	—

TABLE 3. WATER QUALITY FOR THE R.O. FEED FROM THE PILOT

23-Dec-97

Well Name	Date	Lab	Ra228 (pCi/l)	Ra228 error est.	Th230 (pCi/l)	Th230 error est.	ANIONS (meq/l)	CATIONS (meq/l)	BALNC (%)	DSSUM (mg/l)	CAR (ratio)
1316	5/28/94	HMC	1.70	1.40	0.200	---	119	129	3.98	8,130	1.06
	6/1/94	HMC	< 1.000	---	< 0.200	---	132	134	0.840	8,926	1.03
	6/2/94	HMC	1.000	0.500	< 0.200	---	132	136	1.33	8,954	1.02
	6/3/94	HMC	1.80	0.500	< 0.200	---	131	126	-1.86	8,677	1.05
	6/7/94	HMC	4.40	2.40	< 0.200	---	134	126	-3.45	8,799	1.04
	7/5/94	HMC	6.90	3.80	< 0.200	---	134	131	-1.03	8,949	1.01
1317	7/13/94	HMC	< 1.000	---	< 0.200	---	193	186	-1.70	12,732	1.02
	8/15/94	HMC	< 1.000	---	< 0.200	---	184	193	2.28	12,412	1.01
	11/2/94	HMC	---	---	---	---	178	178	-0.070	12,102	1.05
1318	8/15/94	HMC	< 1.000	---	< 0.200	---	56.5	54.9	-1.37	3,661	1.06
	9/28/94	HMC	< 1.000	---	< 0.200	---	58.8	59.9	0.900	3,878	0.980
1320	10/1/94	HMC	< 1.000	---	< 0.200	---	29.4	31.8	3.92	18.8	1.000
1322	11/28/94	HMC	2.90	1.20	< 0.200	---	199	191	-1.99	13,087	0.970
	11/29/94	HMC	< 1.000	---	< 0.200	---	201	182	-4.85	12,955	0.980

NOTE:

1316 = R.O. Product for Collection Wells SA and SB
1317 = R.O. Product for Collection Wells DF, DX and DG
1318 = R.O. Product for Collection Wells KA, KB, KC, KD, KE, X and Y
1320 = R.O. Product for Collection Well #2 Deep
1322 = R.O. Product for Collection Wells DF, DX and DG with Water Softening